APPENDIX H Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
BIOFILTER – STRIPS and SWALES																
Preventive Maintenance and Routine Inspections																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Height of vegetation	Average vegetation height exceeds 12 inches, emergence of trees, or woody vegetation	Visual inspection of vegetation throughout strip/swale	Once during wet season, once during dry season.(depending on growth)	Cut vegetation to an average height of 6 inches	Remove any trees, or woody vegetation.	10	43.63	436.3	one-ton truck & hydroseeder	2	26.84	53.68	string trimmer, rake, fork, bags, safety equipment	50	539.98	
Assess adequate vegetative cover	Less than 90 percent coverage in strip invert/swale or less than 70 percent on swale side slope	Visual inspection of strip/swale. Prepare a site schematic to record location and distribution of barren or browning spots to be restored. File the schematic for assessment of persistent problems.	Assess quantity needed in May each year late wet season and late dry season.	Reseed/revegetate barren spots by Nov.		8	43.63	349.04	one-ton truck & hydroseeder	1	48.15	48.15	seed	150	547.19	
				Scarify area to be restored, to a depth of 2-inches. Restore side slope coverage with hydroseed mixture.		0	43.63	0	one-ton truck & hydroseeder	0	26.84	0			0	
				If after 2 applications (2 seasons) of reseeding/revegetating and growth is unsuccessful both times, an erosion blanket or equivalent protection will be installed over eroding areas		0	43.63	0	one-ton truck & hydroseeder	0	26.84	0	blanket	0	0	
Inspect for debris accumulation	Debris or litter present	Visual observation	During routine trashing, per Districts schedule.	Remove litter, and debris.	None	0	0	0	one-ton truck & hydroseeder	0	0	0			0	
Inspect for accumulated sediment	Sediment at or near vegetation height, channeling of flow, inhibited flow due to change in slope.	Visual observation	Annually	Remove sediment. If flow is channeled, determine cause and take corrective action. If sediment becomes deep enough to change the flow gradient, remove sediment during dry season, characterize and properly dispose of sediment, and revegetate.		16	43.63	698.08	one-ton truck & hydroseeder	1	48.15	48.15	seed, testing and disposal of sediment	300	1046.23	once every three years

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						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
				Notify engineer to determine if regrading is necessary. If necessary, regrade to design specification and revegetate swale/strip. If regrading is necessary, the process should start in May. Revegetate strip/swale in Nov. Target completion prior to wet season.	None	2	43.63	87.26				0			87.26	
Inspect for burrows	Burrows, holes, mounds	Visual observation	Annually and after vegetation trimming.	Where burrows cause seepage, erosion and leakage, backfill firmly.		0	0	0	one-ton truck & hydroseeder	0	26.84	0			0	
General Maintenance Inspection	Inlet structures, outlet structures, side slopes or other features damaged, significant erosion,emergence of trees, woody vegetation , fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season.	Corrective action prior to wet season. Consult engineer if an immediate solution is not evident.	Remove any trees, or woody vegetation.	16	43.63	698.08	one-ton truck & hydroseeder	2	26.84	53.68			751.76	
TOTAL BIO FILTER AND SWALES						52		2268.76				203.66		500	2972.42	
BIO STRIP WITH SPREADER DITCH					Includes all the above plus the following.			0				0			0	
Inspect for standing water	Water accumulation in spreader ditch	Standing water in spreader ditch	Within 72 hours after a storm event 0.75 inches or greater.	De-water the spreader ditch to a depth of less than 0.25 inches. If sediment impedes the de-watering activity, then move or remove that portion of the sediment. Characterize and properly dispose.		3	43.63	130.89	0	0	0	0			130.89	
				De-water the spreader ditch to a depth of less than 0.25" by removing the bypass plug and allowing the water to drain into the infiltration trench. Use care to prevent sediment from discharging into the infiltration trench. Replace the bypass plug once the de-watering has been completed.		6	43.63	261.78	0	0	0	0			261.78	

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						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
				At the end of the wet season, remove the bypass plug and allow the spreader ditch to drain. Use care to prevent sediment from discharging into the infiltration trench. Remove, characterize, and dispose of sediment from the spreader ditch. Replace the bypass plug before the beginning of the wet season.		2	43.63	87.26	sedan	1	21.28	21.28	testing & disposal costs	200	308.54	
TOTAL BIO STRIP WITH SPREADER DITCH						55		2399.65				203.66		500	3103.31	
CONTINUOUS DEFLECTIVE SEPARATION (CDS) UNITS																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Inspect sump for accumulation of material.																
	or							0				0			0	
	When the sump is 50% full during two consecutive monthly inspections.							0				0			0	
	or															
	Annually in May, effect cleaning within 15 days			Empty unit		72	43.63	3141.36	one-ton truck & vactor	3	198.75	596.25	testing & disposal costs	1800	5537.61	
								0				0			0	
Inspect weir box for accumulation of material.	Presence of trash and debris	Visual observation	Monthly during the wet season	Remove trash and debris while onsite conducting inspection.		0	0	0		0	0	0		0	0	Hours accounted for during inspections
Inspect for standing water. (Include with all of inspection)	Standing water in sump	Visual observation	Annually, 72 hours after target2 storm (0.75 in)	If standing water cannot be removed or remains through the wet season notify VCD.	None											
Inspect the screen for damage and to ensure that it is properly fastened.	Screen becomes clogged, damaged or loose	Visual observation	Annually before wet season.	Clean screen.	None	0	0	0	0	0	0	0	0	0	0	Hours accounted for during inspections
Inspection for structural integrity	Holes in screen, large debris, damage to housing or weir box	Visual observation	Annually or after a cleanout.	Immediately consult with engineer and manufacturer's representative to develop a course of action, effect repairs prior to the wet season.	None			0				0			0	Hours accounted for during inspections
TOTAL CDS UNITS						72		3141.36				596.25		1800	5537.61	
DRAIN INLET INSERTS – FOSSIL FILTER																

APPENDIX H Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Inspect for debris/trash	Sufficient debris/trash that could interfere with proper functioning of insert	Visual observation	During the wet season:				43.63	0				0			0	
□ Before and once during each target2 storm (0.25 in) event				Remove and properly dispose of debris/trash. Target completion period while onsite conducting inspection.		18	43.63	785.34				0			785.34	
Oil and grease removal	Absorbent granules dark gray, or darker, or unit clogged with sediment.	Visual observation	□ At the end of each target2 storm (0.25 in) event	Replace Fossil FilterTM adsorbent within 10 working days. Characterize and properly dispose spent media prior to wet season.		2	43.63	87.26				0			87.26	
Inspection for structural integrity	Broken or otherwise damaged insert	Visual observation	Twice per year in October and May.	Replace insert or immediately consult vendor to develop course of action, effect repairs within 10 working days	None	2	43.63	87.26				0			87.26	
Annual renewal of medium	End of wet season, April 30	None	Annually, in May	Remove, characterize, and properly dispose of media a Replace media before Oct 1	None	2	43.63	87.26	sedan	1	21.28	21.28	new adsorbent and testing & disposal costs	115	223.54	
TOTAL DRAIN INLET INSERTS-FOSSIL FILTERS						24		1047.12				21.28		115	1183.4	
DRAIN INLET INSERTS – STREAM GUARD																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Sediment removal	Sediment more than 6-inches	Visual inspection of sediment collected within insert	During the wet season:	Replace insert. Target completion while onsite conducting inspection.				0				0			0	
Inspect for debris/trash	Sufficient debris/trash that could interfere with proper functioning of insert	Visual observation	During the wet season	Remove and dispose of debris/trash. Target completion period while onsite conducting inspection.				0				0			0	
Oil and grease removal	When oil absorbent polymer becomes saturated with oil	Visual observation (absorbent polymer expansion indicates oil saturation)	Monthly	Within 10 working days, replace oil absorbent polymer		2	43.63	87.26				0			87.26	
Inspection for structural integrity	Signs of rips, gashes, and/or fallen media	Visual observation	Twice per year in October and May.	Replace insert or immediately consult vendor to develop a course of action, effect repairs within 10 working days	None	2	43.63	87.26				0			87.26	

APPENDIX H Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Annual renewal of medium	End of wet season, April 30	None	Annually, in May	Remove characterize, and properly dispose of media.. Replace media before Oct 1	None	2	43.63	87.26	sedan	1	21.28	21.28	new adsorbent and testing & disposal costs	195	303.54	
TOTAL DRAIN INLET INSERTS-STREAM GUARDS						6		261.78				21.28		195	478.06	
EXTENDED DETENTION BASINS																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Basin side slope planted for erosion protection and planted invert	Average vegetation height greater than 12-inches, emergence of trees or woody vegetation,	Visual observation and random measurements through out the side slope area	Once during wet season, once during dry season.	Cut vegetation to an average height of 6-inches and remove trimmings. Remove any trees, or woody vegetation.		48	43.63	2094.24	one-ton truck	2	26.84	53.68	string trimmer, rake, fork, bags, safety equipment	50	2197.92	
Slope stability	Evidence of erosion	Visual observation	October each year	Reseed/revegetate barren spots prior to wet season.		0	43.63	0	one-ton truck & hydroseeder	0	48.15	0	seed	150	150	
				Contact environmental or landscape architect for appropriate seed mix.												
				Scarify surface if needed.												
				If after two applications (2 seasons) of reseeding/revegetating and growth is unsuccessful both times, an erosion blanket or equivalent protection will be installed over eroding areas. No erosion blanket will be installed in the basin invert.	NOT AN ANNUAL COST	0	43.63	0	one-ton truck	0	26.84	0	blanket	0	0	
Inspect for standing water.	Standing water for more than 72 hours	Visual observation	Annually, 72 hours after a target2 storm (0.75 in) event	□ Drain facility	None											
				□ Check and unclog clogged orifice.	Should be Annual Mtce.											
				Notify engineer, if immediate solution is not evident.												
Inspection for trash and debris	Debris/trash present	Visual observation	During routine trashing, per Districts schedule.	Remove and dispose of trash and debris	None											
Inspection for sediment management and characterization of sediment for removal	□ Sediment depth exceeds marker on staff gage	□ Measure depth at apparent maximum and minimum accumulation of sediment. Calculate average depth	Annually	Remove and properly dispose of sediment. Regrade if necessary.		16	43.63	698.08	4-yd dump truck, backhoe & trailer, one-ton truck & hydroseederse dan	0.4	176.5	70.6	testing and disposal	460	1228.68	once every 5 years

APPENDIX H Estimated O & M Costs for BMP Project

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						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Inspect for burrows	Burrows, holes, mounds	Visual observation	Annually and after vegetation trimming.	□ Where burrows cause seepage, erosion and leakage, backfill firmly.												
General Maintenance Inspection	Inlet structures, outlet structures, side slopes or other features damaged, significant erosion, emergence of trees or woody vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season Monthly	Corrective action prior to wet season. Consult engineers if immediate solution is not evident.	None	16	43.63	698.08	one-ton truck	2	26.84	53.68			751.76	
TOTAL EXTENDED BASIN						80		3490.4				177.96		660	4328.36	
INFILTRATION BASINS																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Vegetation of basin invert and side slopes	Vegetation height exceeds 12 inches, emergence of trees or woody vegetation,	Visual observation and random measurements through out the side slope and invert area	Once during wet season, once during dry season.	Cut vegetation to an average height of 6-inches. Remove any trees, or woody vegetation.	None	48	43.63	2094.24	two-ton truck	2	50	100	string trimmer, rake, fork, bags, safety equipment	50	2244.24	
Inspect for standing water.	Standing water for more than 72 hours	Visual observation	Annually, 72 hours after a target2 storm (0.75 in) event.	□ Drain facility, if possible.		16	43.63	698.08	one-ton truck	4	26.84	107.36			805.44	
				□ Notify engineer to consider:												
				□ Remove sediment, scarify invert, and regrade if necessary.				0				0			0	covered under sediment removal
				□ If unable to achieve acceptable infiltration rate or implement alternative solution then move to decommission				0				0			0	
				□ If standing water can not be removed then notify VCD.	None											
Inspection for trash and debris at inlet structures	Debris/trash present	Visual observation	During routine trashing, per Districts schedule.	Remove and dispose of trash and debris	None											
Inspection for sediment accumulation	Sediment depth exceeds marker on staff gage.	Measure depth at apparent maximum and minimum accumulation of sediment. Calculate average depth	Annually	Remove, characterize and properly dispose of sediment. Regrade and revegetate bare areas.	None	4	43.63	174.52	4-yd dump truck, loader & trailer, grader, sedan, one-ton truck & hydroseeder	0.5	256.94	128.47	seed, testing & disposal	150	452.99	once every 10 years
Slope stability	Evidence of erosion.	Visual observation	October each year.	Reseed/revegetate barren spots by Nov. Scarify surface if needed.		20	43.63	872.6	one-ton truck & hydroseeder	1	48.15	48.15	seed	275	1195.75	

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						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
				If after two applications (2 seasons) of reseeding/revegetating and growth is unsuccessful both times, an erosion blanket or equivalent protection will be installed over eroding areas. No erosion blanket will be installed in the basin invert.		0	43.63	0	one-ton truck	0	26.84	0	blanket	60	60	
				Contacet environmental or landscape architect for appropriate seed mix.	None	0	43.63	0				0			0	
Inspect for burrows	Burrows, holes, mounds.	Visual observation	Annually and after vegetation trimming.	□ Where burrows cause seepage, erosion and leakage, backfill firmly.	None	0	43.63	0	one-ton truck	0	26.84	0			0	
General Maintenance Inspection	Inlet structures, outlet structures, side slopes or other features damaged, significant erosion, emergence of trees or woody vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season	Take corrective action prior to wet season. Consult engineer if immediate solution is not evident.	None	20	43.63	872.6	two-ton truck	1	50	50			922.6	
TOTAL INFILTRATION BASIN						108		4712.04				433.98		535	5681.02	
INFILTRATION TRENCHES																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Inspect for standing water	Standing surface water for more than 72 hours	Visual observation	Annually, 72 hours after a target2 storm (0.75 in) event	□ Drain facility		16	43.63	698.08	one-ton truck	2	26.84	53.68			751.76	
				□ Notify engineer to consider:		0	43.63	0				0			0	
				□ Undertake investigation for course of action to achieve acceptable infiltration rate. If unable to achieve acceptable infiltration then BMP operations cease.				0				0			0	
				□ If standing water can not be removed, notify VCD.	None			0				0			0	Does not include Vector Control Agency costs
Inspection for trash and debris at inlet and outlet structures	Trash/debris present	Visual observation	During routine trashing per Districts schedule.	Remove and dispose of trash and debris.	None	0	43.63	0				0		0	0	

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						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Inspect for sediment accumulation	Visible sediment	Visual inspection of the stone aggregate, no sediment should be visible at the top of the trench due to sediment buildup from filter fabric.	Annually.	Remove top layer of trench, silt, filter fabric and stone, wash stone and reinstall fabric and stone into trench prior to wet season.	None	8	43.63	349.04	gradeall shovel, 10-yd dump trucks	0.066	6000	396	replacement stone and filter fabric	1200	1945.04	once every 15 years
General Maintenance Inspection	Inlet structures, outlet structures, filter fabric or other features damaged, emergence of trees or woody vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry seasonMonthly	Take corrective action, prior to wet season. Consult engineer if immediate solution is not evident.	None Remove any trees, or woody vegetation.	8	43.63	349.04	one-ton truck	2	26.84	53.68			402.72	
TOTAL INFILTRATION TRENCHES						32		1396.16				503.36		1200	3099.52	
MEDIA FILTERS – PERLITE/ZEOLITE																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
						0	43.63	0	one-ton truck	0	26.84	0			0	
Inspect for sediment accumulation in pre-treatment sedimentation chamber	Sediment occupies 10% of the filter chamber volume.	Measure with appropriate device	Annually in May.			4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				Remove sediment prior to wet season. Characterize sediment and properly dispose	None	8	43.63	349.04	sedan	1	21.28	21.28	testing & disposal costs	600	970.32	
								0				0			0	
Inspect for minor maintenance	Per manufacture's guidelines	None	Annually	Clean per manufacturer's guidelines. Prior to wet season.	None.	4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
Manufacturer's recommended major maintenance	Per manufacture's guidelines	Per manufacture's guidelines	Annually	Consult with manufacturer regarding need for replacement of canisters. If manufacturer confirms need, replace canisters. Prior to wet season. When canisters are changed send canisters to manufacturer to determine remaining life of the media	None	8	43.63	349.04	one-ton truck	1	26.84	26.84	major maintenance	5000	5375.88	By Contract and oversite
Inspection for trash and debris at inlet and outlet structures and within vaults	Trash/debris present	Visual observation	During routine trashing, per Districts schedule.	Remove and dispose of trash and debris when on site conducting inspections.	None	0	43.63	0				0			0	
Inspect for standing water	Water accumulation in any structure or other location within the filter	Standing water in any structure or other location within the filter	Annually, at end of wet season.	□ Gravity drain where possible.		0	43.63	0	one-ton truck	1	0	0			0	

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						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
				□ If standing water can not be removed or remains through wet season notify VCD.	None			0				0			0	Does not include Vector Control Agency costs
General Maintenance Inspection	Inlet structures, outlet structures, vault, piping, or other features damaged and for graffiti or vandalism	Visual observation	Semi-Annually, late wet season and late dry season Monthly	Take corrective action prior to wet season. Consult engineer if immediate solution is not evident.	None	8	43.63	349.04	one-ton truck	2	26.84	53.68			402.72	
TOTALMEDIA FILTERS – PERLITE/ZEOLITE						32		1396.16				155.48		5600	7151.64	
MEDIA FILTERS – SAND W/PUMP																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Drain time of 48 hours	Drain time exceeds 72 hours	Determine drain time by visual observation	Annually, after one target2 storm (0.75 in) event during wet season	□ Remove sediment, trash and debris.		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				□ Check orifice				0				0			0	
				□ Notify engineer to consider removing top 2 inches of media and dispose of sediment. Restore media depth to 18 inches when overall media depth drops to 12 inches. Complete prior to wet season.	Escondido MS Delaware SF – Remove and restore media depth to 12 inches.	12	43.63	523.56	boom truck	0.5	74.94	37.47	drums, shovel, rake, drum grappler, confined space equipment characterization and disposal	1250	1811.03	every 2 years
Inspect for sediment accumulation in sedimentation chamber	Sediment depth exceeds marker on staff gage.	Measure with appropriate device	Measure sediment depth annually.	Remove sediment prior to wet season. Characterize sediment and properly dispose.		12	43.63	523.56	boom truck	0.5	74.94	37.47	drums, shovel, rake, drum grappler, confined space equipment characterization and disposal	1250	1811.03	every 2 years
Inspection for trash / debris	Trash and debris present	Visual observation	During routine trashing, per Districts schedule.	Remove and dispose of trash and debris during routine trashing.	None	0	43.63	0	one-ton truck	0	26.84	0	confined space equipment	0	0	
Inspect pumps for proper functioning	Pump does not operate	Energize pump to see if water is discharged	After every storm.	Make assessment to determine if problem is electrical or mechanical. Take appropriate action. Replace pump if needed.	District 7 filters only	0	43.63	0	one-ton truck	0	26.84	0	confined space equipment	0	0	

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						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Inspect pumps for serviceability and periodic maintenance	Per manufacture's guidelines	Per manufacture's guidelines	Per manufacture's guidelines	Per manufacture's guidelines	District 7 filters only	0	55.7	0	one-ton truck	0	26.84	0	pump or parts, confined space equipment	0	0	
Inspect for burrows	Burrows, holes, mounds.	Visual observation	Annual inspections after vegetation trimming.	□ Where burrows cause seepage, erosion and leakage, backfill firmly.	None			0				0			0	
Inspect for standing water	Water accumulation in any structure or other location within the filter	Standing water in any structure or other location within the filter	Annually, 72 hours after a target2 storm (0.75 in)	□ Gravity drain where possible.		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				□ Notify engineer, if immediate solution is not evident.		2	43.63	87.26				0			87.26	
				□ If standing water can not be removed or remains through wet season notify VCD.	None	2	43.63	87.26				0			87.26	Does not include Vector Control Agency costs
General Maintenance Inspection	Inlet structures, outlet structures, filter fabric or other features damaged, emergence of vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season Monthly	Within 30 working days, take corrective action. Consult engineer if immediate solution is not evident.	None	8	43.63	349.04	one-ton truck	2	26.84	53.68			402.72	
TOTAL MRDIA FILTER-SAND W/PUMP						44		1919.72				182.3		2500	4602.02	
MEDIA FILTERS – SAND WO/PUMP																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Drain time of 48 hours	Drain time exceeds 72 hours	Determine drain time by visual observation	Annually, after one target2 storm (0.75 in) event during wet season	□ Remove sediment, trash and debris.		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				□ Check orifice				0				0			0	
				□ Notify engineer to consider removing top 2 inches of media and dispose of sediment. Restore media depth to 18 inches when overall media depth drops to 12 inches. Complete prior to wet season.	Escondido MS Delaware SF – Remove and restore media depth to 12 inches.	8	43.63	349.04	boom truck	0.33	74.94	24.7302	drums, shovel, rake, drum grappler, confined space equipment characterization and disposal	833	1206.77	every 3 years

APPENDIX H Estimated O & M Costs for BMP Project

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						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Inspect for sediment accumulation in sedimentation chamber	Sediment depth exceeds marker on staff gage.	Measure with appropriate device	Measure sediment depth annually.	Remove sediment prior to wet season. Characterize sediment and properly dispose.		8	43.63	349.04	boom truck	0.33	74.94	24.7302	drums, shovel, rake, drum grappler, confined space equipment characterization and disposal	833	1206.77	every 3 years
Inspection for trash / debris	Trash and debris present	Visual observation	During routine trashing, per Districts schedule.	Remove and dispose of trash and debris during routine trashing.	None	24	43.63	1047.12	one-ton truck	2	26.84	53.68	confined space equipment	50	1150.8	
Inspect for burrows	Burrows, holes, mounds.	Visual observation	Annual inspections after vegetation trimming.	□ Where burrows cause seepage, erosion and leakage, backfill firmly.	None			0				0			0	
Inspect for standing water	Water accumulation in any structure or other location within the filter	Standing water in any structure or other location within the filter	Annually, 72 hours after a target2 storm (0.75 in)	□ Gravity drain where possible.		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				□ Notify engineer, if immediate solution is not evident.		2	43.63	87.26				0			87.26	
				□ If standing water can not be removed or remains through wet season notify VCD.	None	2	43.63	87.26				0			87.26	Does not include Vector Control Agency costs
General Maintenance Inspection	Inlet structures, outlet structures, filter fabric or other features damaged, emergence of vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season Monthly	Within 30 working days, take corrective action. Consult engineer if immediate solution is not evident.	None	8	43.63	349.04	one-ton truck	2	26.84	53.68			402.72	
TOTAL MRDIA FILTER-SAND W/O/PUMP						60		2617.8				210.5		1716	4544.3	
MULTI-CHAMBER TREATMENT TRAINS																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Maximum filter drain time of 72 hrs for design and smaller storms	Drain time greater than 72 hours or sediment accumulation is greater than 0.1 inch over more than 50 percent of the fabric surface area.	Visual observation	After one target2 storm (0.75 in) event during wet season.	□ Remove and replace filter fabric blanket.		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				□ If problem persists, consult with engineer, the media may need to be replaced. Complete prior to wet season.	None	2	43.63	87.26		0	0	0		0	87.26	

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						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Inspection for trash/ debris at inlet and outlet structures and the MCTT	Trash and debris present	Visual observation	.During routine trashing per District schedule	Remove and dispose of trash and debris During routine trashings.	None	0	43.63	0	one-ton truck	0	26.84	0	confined space equipment	50	50	
Inspection for sediment accumulation	Sediment accumulates 50% of the volume underneath the tube settlers. Maximum of 2-feet grit chamber	Measure with appropriate device	Remove tube settler, measure sediment depth annually	Remove sediment prior to wet season. Characterize sediment and properly dispose.	None	36	43.63	1570.68	one-ton truck	1	26.84	26.84	drums, shovel, rake, drum grappler, confined space equipment, characterization and disposal	600	2197.52	
				□ If standing water can not be removed or remains through the wet season notify VCD.	None	2	43.63	87.26				0			87.26	Does not include Vector Control Agency costs
Replace filter media every 3 years per designer's specification	Operation greater than 3 years	Not applicable	Every 3 years	Remove and replace filter media. Characterize and properly dispose.	None	8	43.63	349.04	vactor and one-ton truck	0.33	198.75	65.5875	confined space equipment, characterization and disposal	1200	1614.628	every three yea
Inspect sorbent pillows in main settling chamber	Darkened by oily material	Visual Observation	Annually, in May.	Annually, renew sorbent pillows, or immediately if pillows are darkened by oily material, characterize and properly dispose.	None	4	43.63	174.52	one-ton truck	1	26.84	26.84	sorbent pillow	100	301.36	
Inspect pumps for proper functioning	Pump does not operate	Energize pump to see if water is discharged	After every storm.	Make assessment to determine if problem is electrical or mechanical. Take appropriate action. Replace pump if needed.	None	0	43.63	0	one-ton truck	0	26.84	0	confined space equipment	0	0	
Inspect pumps for serviceability and periodic maintenance	Per manufacture's guidelines	Per manufacture's guidelines	Per manufacture's guidelines	Per manufacture's guidelines	None	0	55.7	0	one-ton truck	0	26.84	0	confined space equipment, pump or parts	0	0	
General Maintenance Inspection	Inlet structures, outlet structures, filter fabric, settling tubes or other features damaged, emergence of vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season	Within 30 working days, take corrective action. Consult engineer if immediate solution is not evident.	None	8	43.63	349.04	one-ton truck	2	26.84	53.68			402.72	
TOTAL MULTI-CHAMBER TREATMENT TRAINS						64		2792.32				199.788		1950	4942.108	
OIL-WATER SEPARATOR																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											

APPENDIX H Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.

						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Inspect for sediment accumulation in the pre-separator and separator chamber	Greater than 12-inches	Measure with appropriate device	Annually	Prior to wet season, remove the accumulated material. Characterize and properly dispose.	None	4	43.63	174.52				0	testing and disposal	120	294.52	every 5 years
Inspect for oil accumulation in oil chamber	Oil depth is not more than 50 percent of chamber volume	Gauge the level of oil/water with a wooden gauge stick	Annually	Prior to wet season remove and properly dispose of oil and grease.	None	1	43.63	43.63				0	testing and disposal	60	103.63	every 5 years
Inspect coalescer for debris and gummy deposits	Debris or gummy deposits present	Visual observation	Annually	Wash the coalescer in an appropriate area with high-pressure hot water when needed.	None	1	43.63	43.63				0			43.63	
Inspect water level in tank	Less than full	Visual observation	Annually	Fill with water prior to wet season.	None	1	43.63	43.63				0			43.63	
Inspect for general mechanical integrity	Per manufacture's guidelines	Per manufacture's guidelines	Annually	Operate each mechanical component to ensure proper operation. Repair as needed	None	4	43.63	174.52				0			174.52	
TOTAL OIL-WATER SEPARATOR						11		479.93				0		180	659.93	
WET BASIN																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
24-hour draw down measured between the rim of the outlet structure and invert of the WQ orifice in the outlet structure.	Drawdown greater than 25 hours or water is flowing over weir.	Evaluate drain time from inlet and outlet flow data loggers or observe 25 hours after target2 storm (0.75 in) Observation of water flowing over spillway	Once during wet season and after completion or modification of the facility,	If >25-hours:		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				□ Open gate to discharge water to permanent pool elevation,		2	43.63	87.26	one-ton truck	1	26.84	26.84			114.1	
				□ Clear outlet of debris.		2	43.63	87.26	one-ton truck	1	26.84	26.84			114.1	
				□ Consult engineer if needed.		2	43.63	87.26	one-ton truck	1	26.84	26.84			114.1	
								0				0			0	
				If water is spilling over weir, open canal gate until water level is at permanent pool elevation. Check/clear outlet of debris.	None	4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
Inspect for burrows	Burrows, holes, mounds	Visual observation	Annually and after vegetation trimming.	Where burrows cause seepage, erosion and leakage, backfill firmly.	None	4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
General Maintenance Inspection	Inlet structures, outlet structures, side slopes or other features damaged, significant erosion, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season	Take corrective action, or restore to as-constructed condition prior to wet season. Consult engineers if immediate solution is not evident.	None	8	43.63	349.04	one-ton truck	2	26.84	53.68			402.72	

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						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Inspect Zone 1 4 for vegetation coverage and density to sustain vector abatement efficacy								0				0			0	
(See attachments for zone locations.)	Observable vegetation coverage/density	Visual, visible vegetation growth or emergent vegetation growth	Quarterly	1. Have a biologist survey the Wet Basin to determine if any birds are nesting or other sensitive animals are present. If birds are nesting, with advice from the biologist, proceed with the maintenance.		8	70	560	sedan	1	21.28	21.28			581.28	
				2. Lower and maintain the water level to expose the area to be maintained, do not completely drain basin		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				3. Mechanically remove allCut plantsvegetation		56	43.63	2443.28	one-ton truck	3	26.84	80.52	string trimmer, hand tools, bags, safety equipment	100	2623.8	
				4. Dispose of the vegetation material in a landfill or other appropriate disposal area.		24	43.63	1047.12	packer	3	53.44	160.32	hand tools, safety equipment	50	1257.44	
				4.5. Restock mosquito fish as recommended by vector control agency.	None	8	70	560	sedan	1	21.28	21.28			581.28	
Inspect Zone 2 4 for vegetation coverage and density to sustain vector abatement efficacy	Vegetation density is such that mosquito fish cannot swim freely in the planted area.	Mosquito fish cannot be seen in the planted area, vegetation density approximately 80 to 100 percent	Quarterly	Annually, or at a special request of the local vector control agency				0				0			0	
								0				0			0	
				1. Have a biologist survey the Wet Basin to determine if any birds are nesting or other sensitive animals are present. If birds are nesting, with advice from the biologist, proceed with the maintenance.		8	70	560	sedan	1	21.28	21.28			581.28	
				2. Lower and maintain the water level to expose the area to be maintained, do not completely drain basin		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	

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				3. Mechanically removeCut Typha sp. (cattail), Scirpus sp. (bulrush) to produce random vegetation clusters (2-5 plants) with clusters at approximately 0.5 meters on center4. An effort should be made to maintain a ratio of Scirpus to Typha of 2:1. If the vegetation is cut, cut the vegetation to below the permanent pool water surface.		56	43.63	2443.28	one-ton	3	26.84	80.52	string trimmer, hand tools, bags, safety equipment	100	2623.8	
				4. Dispose of the vegetation material in a landfill or other appropriate disposal area.		24		0	packer	3	53.44	160.32	hand tools, safety equipment	50	210.32	
				5. Monitor vegetation density quarterly to determine grow back rate.	None	4	43.63	174.52	one-ton	1	26.84	26.84			201.36	
Maintain Vegetated Access Road to reduce fire hazard from contact with vehicle catalytic converters.								0				0			0	
								0				0			0	
Inspect for sediment accumulation in forebay and main pond	More than 2 inches in the forebay and 4 inches in the main pond, or	Sediment depth exceeds marker on staff gage.						0				0			0	life cycle
		Measure in forebay by estimating depth using stationing along concrete maintenance ramp. In main pond by measuring down from water quality orifice and comparing to as-constructed grade.	When pond is drained for Zone 1 vegetation removal, or every 3 years.	Remove and properly dispose of sediment. By November, restore vegetation to the plan shown on the as-built drawings.	La Costa site only			0				0			0	life cycle
.								0				0			0	
								0				0			0	
								0				0			0	
TOTAL WET BASIN						222		9271.62				840.76		300	10412.38	

NOTES:

1. The design storm event is a storm that has a one year, 24 hour recurrence frequency.
2. A target storm event is a storm greater than 0.7525 inches of rainfall. For drain inlet inserts, a target storm event is a storm with a prediction of greater than 0.25 inches of rainfall.
3. Woody wetland vegetation consists of: willows (Salix spp), mule fat (baccharis salicifolia), cottonwood (populus fremontii), and western sycamore (plantanus racemosa). Note, this criterion is not applicable to the wet basin.
4. Zone 1, open water area of the basin, average depth is about 3 feet. Zone 2, shallow water bench, depth of water 0 –12 inches. Zone 3, periodic inundation is the temporary water storage volume impounded between the permanent pool and the overflow weir, i.e. the water quality storage. (See attachments for zone locations.) Zone A is the remaining upland slope between Zone 3 and the maintenance road.

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						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	

This maintenance indicator Document has been developed using site specific information gathered by specialists trained in the identification of threatened and endangered species and their habitat. Information contained in this document includes guidance for inspection for possible threatened and endangered species harborage. Further, some of the maintenance recommendations are based on the requirements of specific plant species used in this Pilot Program. The recommendations provided in this document must be reassessed with respect to species and plant materials if the guidance contained herein is to be used for a separate project in another area.